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वस्त्रादि रंजक पदार्थ — रंजकों के प्रकीर्णन व्यवहार को ज्ञात करना

Indian Standard

TEXTILE DYESTUFFS — DETERMINATION OF DUSTING BEHAVIOUR OF DYES

ICS 59.020

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

March 1996

Price Group 2

Dyestuffs Sectional Committee, TX 17

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Dyestuffs Sectional Committee had been approved by the Textile Division Council.

The dustiness of dyestuffs is an important feature as it affects the hygiene, health and safety in the dyestuff consuming industry.

For determining the dusting behaviour of dyes, a number of methods such as air current method, rotating drum method and gravity method, are in vogue; the results of which may vary considerably. A reliable method should generate dust in such a way that the particle size of dye is not altered. Accordingly, this standard on gravity method has been prepared because it roughly approximates actual handling conditions and provides results that are close to those of actual practice and relatively readily reproducible.

Indian Standard

TEXTILE DYESTUFFS — DETERMINATION OF DUSTING BEHAVIOUR OF DYES

1 SCOPE

This standard prescribes gravity method for the qualitative and quantitative determination of dusting behaviour of dyes.

2 REFERENCE

2.1 IS 768 : 1982 'Method for evaluating change in colour (*first revision*)' is a necessary adjunct to this standard.

3 TERMINOLOGY

For the purpose of this standard, the following definition shall apply.

3.1 Dust

Dust consists of particles of solid material dispersed in gas (in this case air). Dyestuff dust is formed during handling operations such as dispensing, transferring, sprinkling, etc.

NOTES

1 Solid dyes are sold in different physical forms (powdered, granulated, etc). The particle-size distribution of commercial products varies considerably. The mean particle diameter may be less than 50 μm or as much as several millimetres. The range of the particle-size distribution of a solid dye may also be narrow or wide.

2 The particle-size distribution of dyestuff dust is largely independent of the physical form of the dyestuff.

4 PRINCIPLE

4.1 Dust is generated from a dye sample by means of a dust-generating device, extracted from the dust-bearing air by vacuum and conveyed to the detection point. The amount of dust generated is estimated visually or determined quantitatively by a gravimetric or photometric method.

NOTE — The gravity method for generating dust only provides meaningful results capable of differentiating when the amount of dust used for the detection is sufficient for the method of determination in question. With dyes, the amount of dust generated in each case depends on the product and the fall conditions, such as the amount allowed to drop, the geometry of the point of impact. The extraction conditions influence the collection and measurement of dust and as such must be precisely defined (start, duration, flow rate). The factors affecting scattering of results are given in Annex A.

5 APPARATUS

5.1 Balance, having an accuracy of ±0.1 g.

5.2 Dust Generating Device (*see* Fig. 1), with filter holder (*see* Fig. 2) and connecting joints (*see* Note under **5.2.5**), and incorporating the following additional components.

5.2.1 *Filter*, white, diameter 50 mm, made of cellulose nitrate, capable of trapping the dust quantitatively (pore size $\leq 5 \mu$m) for the gravimetric and photometric methods. For the visual method, suitable glass-fibre filters can be used.

5.2.2 *Vacuum Pump*, with a delivery capacity of at least 20 l/min.

5.2.3 *Regulator*, for adjusting the air flow rate.

5.2.4 *Flowmeter*, for monitoring the air flowrate (measurement range: 10 l/min to 20 l/min).

5.2.5 *Timer*, for opening the slide valve to start suction, and for timing the period of suction.

NOTE — Instead of a filter holder, other dust-detection devices may be fitted to the apparatus, such as an impactor or an optical particle counter.

5.3 Grey Scale for Assessing Staining (*see* IS 768:1982)

5.4 Analytical Balance, accuracy ±0.01 mg, for weighing the dust collected on the filter (gravimetric method), and/or photometer, for extinction measurement of the dust collected and dissolved in a suitable solvent (photometric method).

5.5 Cleaning Device, such as brush or vacuum cleaner, for cleaning the apparatus.

6 PROCEDURE

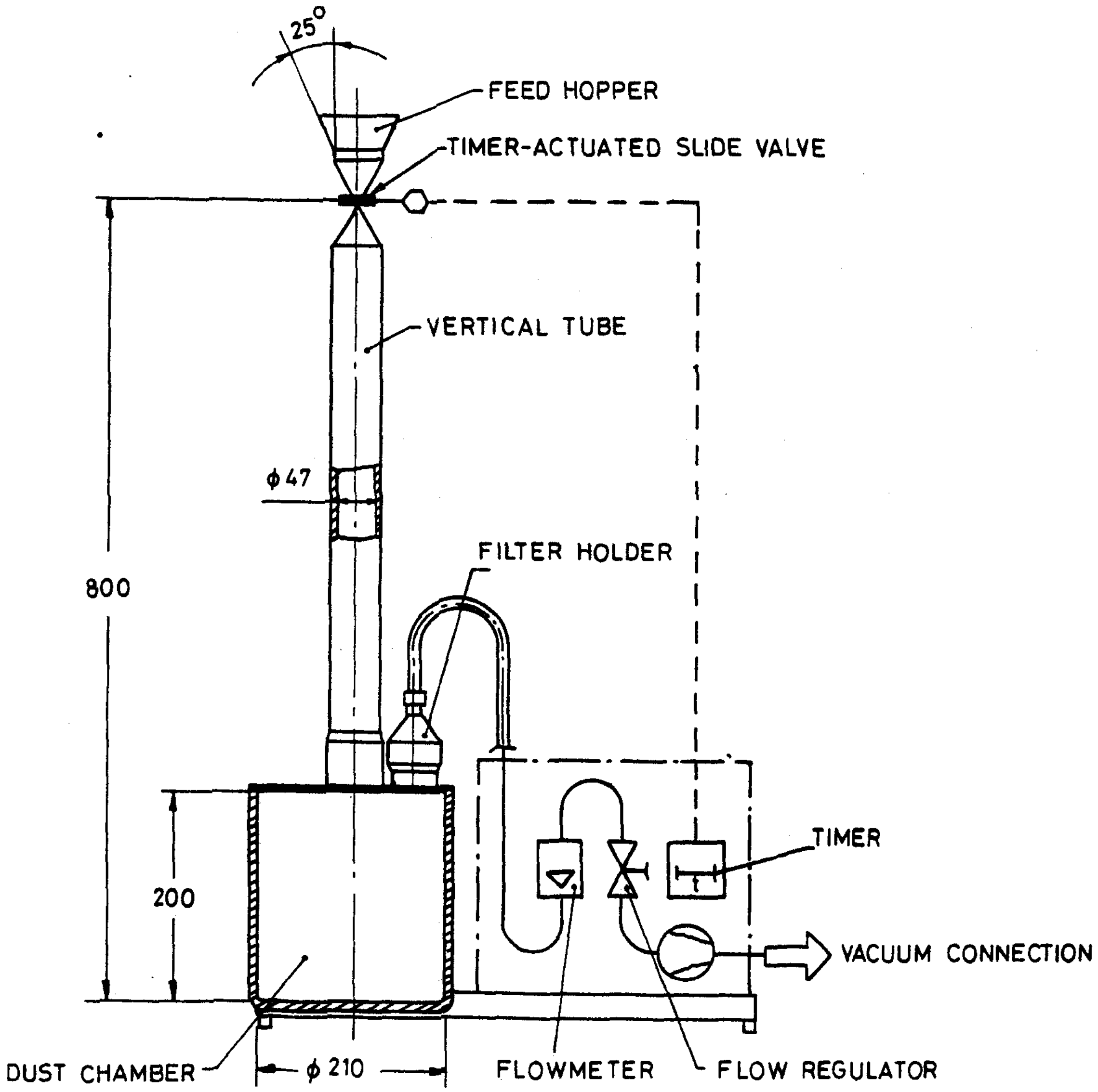
6.1 Place the filter holder with the filter in the dust generating apparatus and close it to give an air-tight fit. Carefully weigh out 10 g ± 0.1 g of the dye and place it in the hopper at the top of the apparatus. Open the slide valve with a sudden action, allowing the dye to drop down through the tube to the bottom of the dust chamber.

6.2 Five seconds after the slide valve has been opened, apply a vacuum to extract the dust from the chamber for collection on the filter under the following conditions:

- Flow rate : 15 l/min
- Extraction time : 120 s (starting 5 s after the dye has dropped)
- Height of fall : 80 cm

6.3 Using tweezers, carefully remove the dust-laden filter from the holder and evaluate it by one of the methods given in **7**.

6.4 Clean the equipment thoroughly after each test. If the equipment is wet-cleaned, take particular care that it is dried thoroughly.



All dimensions in millimetres.

FIG. 1 DUST TEST APPARATUS

7 EVALUATION OF THE FILTER

7.1 Visual Method

Compare the dust-laden filter visually with the grey scale for assessing staining (*see* **5.3**) and assign suitable rating using the following scale : Rating 1 = very dusty to Rating 5 = no dust. Half rating may be used.

NOTES

1 It is also possible to carry out a visual assessment of colourless substances. However, special care must be exercised in such case. Black filters may be helpful, but separate preliminary trials must be carried out. It is preferable to use the gravimetric or photometric method.

2 A quantitative determination of the amount of dust produced by a dye is not possible by this method. Visual assessment is subjective and depends on factors such as the experience of the examiner, the hue of the layer of dust and the nature of the filter surface (smooth or rough). Variations of up to half a rating unit are inherent in this system. Empirically, the total error under repeatability conditions (same apparatus and laboratory) does not exceed this value.

7.2 Gravimetric Method

Condition the filter before weighing it both with and without dust and calculate the percentage of dust trapped on the filter.

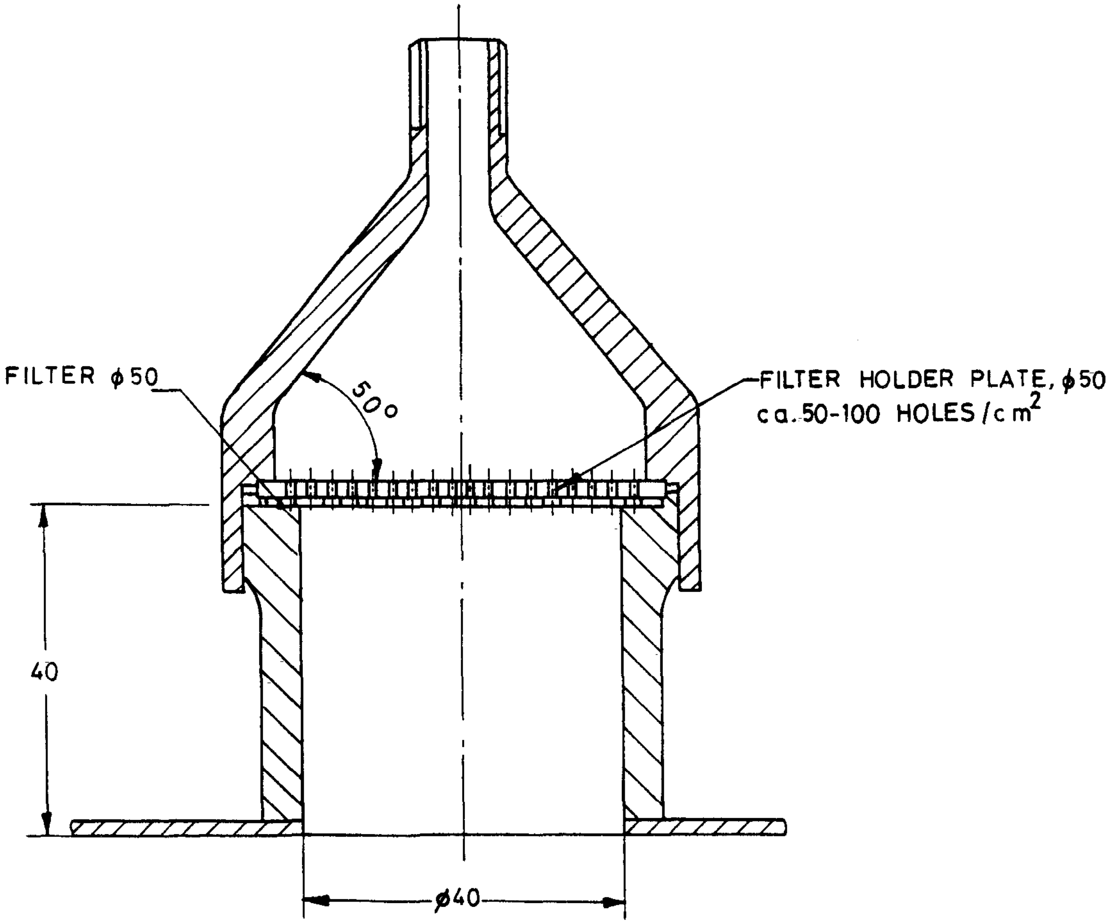
NOTES

1 There are chances of considerable error with low-dusting products as the amount of dust is very small (<1 mg). In such cases, preference should be given to photometric measurement.

2 In this method, the conditions under which the filter is conditioned and electrostatic influences can lead to substantial errors.

7.3 Photometric Method

Dissolve the dyestuff by shaking the filter in a suitable solvent at room temperature and when a clear solution



All dimensions in millimetres

FIG. 2 FILTER HOLDER

is formed, measure the transmission with a photometer and read the amount of dust from a previously prepared calibration graph.

NOTE — The amount of dust measured must not be equated with the amount of 'fine dust' actually present in the product. For example, the amount of dust is not doubled by doubling the amount of test specimen. It is not a specific value and therefore cannot be expressed in mg/kg.

8 REPORT

The report shall include the following:

a) Description of the dyestuff under test;
b) Exact mass of sample taken for test;
c) The air flow rate;
d) The extraction time;
e) The filter grade;
f) Visual assessment rating and/or mass of dust in milligrams;
g) Evaluation method used; and
h) Details of deviations, if any, from the procedure.

ANNEX A

(*Clause* 4.1, *Note*)

SCATTER OF RESULTS

In some cases, scattering of the results may occur. The main causes of this are:

a) Factors specific to the apparatus:
   - — the air flow rate is incorrectly adjusted;
   - — the air flow through the apparatus is not constant, or the vacuum is incorrectly applied; and
   - — the timing control is imprecise.

These errors can be minimized by making appropriate adjustments to the apparatus.

b) External factors:
   - — humidity;
   - — electrostatic charges inside the vertical tube and the dust chamber; and
   - — inhomogeneous distribution of the dust within the sample.

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